

Disorders of the mitochondrial genome in human and canine tumors

Summary

Mitochondria are eukaryotic organelles that are involved in many metabolic pathways. These organelles play a major role in the process of oxidative phosphorylation (OXPHOS) and apoptosis. Genetic changes in mtDNA may disrupt these processes and lead to abnormal cell function. Abnormalities in nucleotide sequence of mitochondrial DNA are identified as being characteristics of malignant cells. Changes observed in mtDNA can occur in the early stage of carcinogenesis. Until now, no specific mutations for type of tumor have been found in mitochondrial DNA. After many years of research of mtDNA mutations in malignant transformation, it is still not clear whether mutations present in mitochondrial DNA are primary in relation to a cancer or secondary acquired during carcinogenesis. Disclosure of mutations after a long period of occurrence (when mutated gene occurs predominantly) and slowly progressive nature of symptoms may indicate a primary character of these mutations. Despite intensive studies, the impact of mitochondria on carcinogenesis process is still not clear. Continuation of studies on relationship between mutations of mtDNA and occurrence of cancers can become the basis for identification of prognostic and diagnostic markers for early detection of malignant transformation process and development of new methods of treatments for both humans and dogs. The results of study on oncogenomics of dog, as a model animal, can be employed in the future in human medicine.

KEY WORDS: mutations, genes, mtDNA, cancer